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IN THE CLAIMS

1. (Currently amended) A bonded abrasive tool, comprising a three-dimensional composite of

(a) a first phase comprising 24-48 vol % abrasive grains bonded with 10-38 vol % organic bond material and less than 10 vol% porosity; and

(b) a second phase consisting of 38-54 vol% interconnected porosity;

wherein the second phase is a continuous phase within the composite thereby making the composite permeable to fluid flow via channels formed with interconnected porosity, and the bonded abrasive tool has a minimum burst speed of 4000 sfpm (20.32 m/s).

2. (Original) The bonded abrasive tool of claim 1, wherein the first phase of the composite comprises 26-40 vol % abrasive grains bonded with 10-22 vol % organic bond material and less than 10 vol % porosity, and the second phase consists of 38-50 vol % porosity.

3. (Original) The bonded abrasive tool of claim 1, wherein the first phase of the composite comprises 24-42 vol % abrasive grains bonded with 18-38 vol % organic bond material, and the second phase consists of 38-54 vol % porosity.

4. (Original) The bonded abrasive tool of claim 1, wherein 10 to 100 vol % of the abrasive grains in the first phase of the composite are in the form of a plurality of grains agglomerated together with an organic binder material.

5. (Original) The bonded abrasive tool of claim 1, wherein 10 to 100 vol % of the abrasive grains in the first phase of the composite are in the form of a plurality of grains agglomerated together with an inorganic binder material.

6. (Original) The bonded abrasive tool of claim 5, wherein the composite comprises a minimum of 1 vol% inorganic binder material.

7. (Original) The bonded abrasive tool of claim 5, wherein the composite comprises 2 to 12 vol % inorganic binder material.

8. (Original) The bonded abrasive tool of claim 5, wherein the bonded abrasive tool has a maximum elastic modulus value of 10 GPa and a minimum burst speed of 6000 sfpm (30.48 m/s).

9. (Currently amended) The bonded abrasive tool of claim 5, wherein the bonded abrasive tool has a hardness grade between A and H on the Norton Company grade scale~~, and the hardness grade of the bonded abrasive tool is at least one grade softer than that of an otherwise identical conventional tool made with abrasive grains that have not been agglomerated together with an inorganic binder material~~.

10. (Currently amended) The bonded abrasive tool of claim 5, wherein the inorganic ~~bond~~ binder material is selected from the group consisting of vitrified bond materials, ceramic bond materials, glass-ceramic bond materials, inorganic salt materials and metallic bond materials, and combinations thereof.

11. (Currently amended) The bonded abrasive tool of claim 1, wherein 10 to 100 vol % of the abrasive grains in the first phase of the composite are in the form of a mixture, the mixture including ~~of~~ a plurality of grains agglomerated together with an inorganic binder material and a plurality of grains agglomerated together with an organic binder material.

12. (Original) The bonded abrasive tool of claim 1, wherein the first phase of the composite is a reticulated network of abrasive grain anchored within the organic bond material.

13. (Original) The bonded abrasive tool of claim 1, wherein the organic bond material is selected from the group consisting of phenolic resin materials, epoxy resin materials, polyimide resin materials, phenol formaldehyde resin materials, urea formaldehyde resin materials, melamine formaldehyde resin materials, acrylic resin materials and combinations thereof.

14. (Original) The bonded abrasive tool of claim 1, wherein at least 50 vol % of the abrasive grains in the first phase of the composite are in the form of a plurality of grains agglomerated together with an organic binder material.

15. (Currently amended) A bonded abrasive tool comprising a three-dimensional composite of

(a) 22-~~46~~ 52 vol % abrasive grains bonded with 4-20 vol % inorganic bond material, wherein a majority of the abrasive grains are present as irregularly spaced clusters within the three-dimensional composite; and

(b) 40-68 vol% interconnected porosity; between the irregularly spaced clusters ~~wherein a majority of the abrasive grains are present as irregularly space clusters within the three-dimensional composite~~, thereby making the composite permeable to fluid flow via channels formed with interconnected porosity;

wherein the bonded abrasive tool has an elastic modulus value ~~that is at least 10 % lower than the elastic modulus value of an otherwise identical conventional tool having regularly spaced abrasive grains within a three-dimensional composite; and the bonded abrasive tool has~~ of 55 GPa or less and a minimum burst speed of 4000 sfpm (20.32 m/s).

16. (Original) The bonded abrasive tool of claim 15, wherein the three-dimensional composite comprises 22-40 vol % abrasive grains bonded with 8-14 vol % inorganic bond material, and 40-64 vol % interconnected porosity.

17. (Original) The bonded abrasive tool of claim 15, wherein the three-dimensional composite comprises 34-42 vol % abrasive grains bonded with 6-12 vol % inorganic bond material, and 46-58 vol % interconnected porosity.

18. (Original) The bonded abrasive tool of claim 15, wherein the interconnected porosity has been formed without adding porosity inducing materials during manufacturing and the composite is substantially free of high aspect ratio particles of abrasive grains and fillers.

19. (Original) The bonded abrasive tool of claim 15, wherein 10 to 100 vol % of the abrasive grains in the composite are in the form of a plurality of grains agglomerated together with an inorganic binder material.

20. (Original) The bonded abrasive tool of claim 15, wherein at least 50 vol % of the abrasive grains in the composite are in the form of a plurality of grains agglomerated together with an inorganic binder material.

21. (Original) The bonded abrasive tool of claim 15, wherein the inorganic bond material is selected from the group consisting of vitrified bond materials, ceramic bond materials, glass-ceramic bond materials, inorganic salt materials and metallic bond materials, and combinations thereof.

22. (Currently amended) The bonded abrasive tool of claim 15, wherein the bonded abrasive tool has a hardness grade between A and M on the Norton Company grade scale~~, and the hardness grade of the bonded abrasive tool is at least one grade softer than that of an otherwise identical conventional tool having regularly spaced abrasive grains within a three-dimensional composite~~.

23. (Currently amended) The bonded abrasive tool of claim 15, wherein the bonded abrasive tool has an elastic modulus value ~~that is at least 25 % lower than the elastic modulus value of an otherwise identical conventional tool having regularly spaced abrasive grains within a three-dimensional composite and the bonded abrasive tool has~~of 41 GPa or less and a minimum burst speed of 6000 sfpm (30.48 m/s).

24. (Currently amended) The bonded abrasive tool of claim 15, wherein the bonded abrasive tool has an elastic modulus value ~~that is at least 40 % lower than the elastic modulus value of an otherwise identical conventional tool having regularly spaced abrasive grains within a three-dimensional composite and the bonded abrasive tool has~~ of 33 GPa or less and a minimum burst speed of 6000 sfpm (30.48 m/s).

25. (Original) The bonded abrasive tool of claim 15, wherein the bonded abrasive tool is an inner diameter grinding wheel and the wheel contains 40 to 52 vol % abrasive grain and has an elastic modulus value of 25 to 50 GPa.

26. (Original) The bonded abrasive tool of claim 15, wherein the bonded abrasive tool is a toolroom grinding wheel and the wheel contains 39 to 52 vol % abrasive grain and has an elastic modulus value of 15 to 36 GPa.

27. (Original) The bonded abrasive tool of claim 15, wherein the bonded abrasive tool is a creep feed grinding wheel and the wheel contains 30 to 40 vol % abrasive grain and has an elastic modulus value of 8 to 25 GPa.

28. (Currently amended) A method for disc grinding, comprising the steps of:

(a) providing a bonded abrasive wheel, comprising a three-dimensional composite of

(i) a first phase comprising 24-48 vol % abrasive grains bonded with 10-38 vol % organic bond material and less than 10 vol% porosity; and

(ii) a second phase consisting of 38-54 vol% interconnected porosity;

wherein the second phase is a continuous phase within the composite thereby making the composite permeable to fluid flow via channels formed with interconnected porosity, and the bonded abrasive tool has a minimum burst speed of 4000 sfpm (20.32 m/s);

~~(b) mounting the bonded abrasive wheel on a surface grinding machine;~~

~~(c) rotating the wheel; and~~

(d~~b~~) ~~bringing a~~ grinding ~~surface of the wheel into contact with~~ a workpiece ~~for a sufficient period of time to grind the workpiece~~ with the wheel;

whereby the wheel removes workpiece material at an effective material removal rate, the grinding surface of the wheel remains substantially free of grinding debris and, after grinding has been completed, the workpiece is substantially free of thermal damage.

29. (Original) The method for disc grinding of claim 28, wherein the bonded abrasive wheel has a minimum burst speed of 6000 sfpm (30.48 m/s).

30. (Original) The method for disc grinding of claim 28, wherein the bonded abrasive wheel is rotated at a speed of 4000 to 6500 sfpm (20.32 to 33.02 m/s).

31. (Original) The method for disc grinding of claim 28, wherein the bonded abrasive wheel is a flat disc, having at least one circular face and a radial perimeter and the grinding surface of the wheel is the circular face of the disc.

32. (Currently amended) A method for creep feed grinding, comprising the steps of:

(a) providing a bonded abrasive wheel comprising a three-dimensional composite of

(i) 22~~-46~~-52 vol % abrasive grains bonded with 4-20 vol % inorganic bond material, wherein a majority of the abrasive grains are present as irregularly spaced clusters within the three-dimensional composite; and

(ii) 40-68 vol% interconnected porosity;~~wherein a majority of the abrasive grains are present as irregularly space clusters within the three-dimensional composite~~ between the irregularly spaced clusters, thereby making the composite permeable to fluid flow via channels formed with interconnected porosity;

wherein the bonded abrasive tool has an elastic modulus value ~~that is at least 10 % lower than the elastic modulus value of an otherwise identical conventional tool having regularly spaced abrasive grains within a three-dimensional composite; and the bonded abrasive tool has~~ of 55 GPa or less and a minimum burst speed of 4000 sfpm (20.32 m/s);

~~(b) mounting the bonded abrasive wheel on a creep feed grinding machine;~~

~~(c) rotating the wheel; and~~

(d~~b) bringing a~~ grinding ~~surface of the wheel into contact with~~ a workpiece ~~for a sufficient period of time to grind the work piece~~with the wheel;

whereby the wheel removes workpiece material at an effective material removal rate and, after grinding, the workpiece is substantially free of thermal damage.

33. (Original) The method of claim 32 for creep feed grinding, wherein the bonded abrasive wheel has a minimum burst speed of 6000 sfpm (30.48 m/s).

34. (Original) The method of claim 32 for creep feed grinding, wherein the bonded abrasive wheel is rotated at a speed of 5500 to 8500 sfpm (27.94 to 43.18 m/s).

35. (Original) The method of claim 32 for creep feed grinding, wherein the bonded abrasive wheel has two circular faces and a radial perimeter and the grinding surface of the wheel is the radial perimeter.

36. (New) The bonded abrasive tool of claim 1, wherein the bonded abrasive tool is subjected to thermal processing during its manufacture, and bond migration during the thermal processing has effectively decreased porosity of the first phase to the less than 10 vol% range and effectively increased porosity of the second phase to the 38-54 vol% range.

37. (New) The bonded abrasive tool of claim 1, wherein the bonded abrasive tool is subjected to thermal processing during its manufacture, and the interconnected porosity results at least in part from thermal-induced migration of second phase binder material into irregularly spaced clusters that include the abrasive grains and organic bond material of the first phase.

38. (New) The bonded abrasive tool of claim 1, wherein the interconnected porosity results at least in part from thermal-induced migration of second phase binder material into first phase porosity.

39. (New) The bonded abrasive tool of claim 15, wherein the bonded abrasive tool is subjected to thermal processing during its manufacture, and the interconnected porosity results at least in part from thermal-induced migration of binder material into the irregularly spaced clusters.